Amendments to the Claims:

Please amend Claims 1, 18, 25, 28, and 45. The Claim Listing below will replace all prior versions of the claims in the application:

Claim Listing:

1. (Currently amended) A method for increasing the efficiency of a system comprising a fuel reformer coupled to a fuel cell, the method comprising the steps of:

14/16 providing pressurized air; (64)

using heat generated by the fuel cell to make a pressurized air/steam mixture, optionally in admixture with water, by direct evaporation of cooling water from the fuel cell into pressurized air;

introducing the air/steam mixture as an oxidant into a cathode fuel burner;

producing a steam-containing exhaust having an expansion potential from the fuel burner;

driving an expander using the expansion potential of the steam-containing exhaust; and,

recovering mechanical energy from the expander in excess of the energy used in compressing the pressurized air.

2. (Previously presented) The method of Claim 1, further comprising the step of preheating the air/steam mixture in the steam-containing exhaust of the fuel burner before introduction into the burner.

3. (Original) The method of Claim 1, further comprising the step of using the air/steam mixture as a humidified oxidant of a fuel cell.

4. (Previously presented) The method of Claim 1, further comprising the step of introducing additional water into the air/steam mixture.

5. (Previously presented) The method of Claim 4, wherein the step of introducing additional water occurs after the mixture has emerged from the fuel cell.

6. (Original) The method of Claim 1, wherein the steam-containing exhaust is a heat source for a fuel reformer.

7. (Original) The method of Claim 6, wherein the fuel reformer conducts at least one reaction selected from the group consisting of steam reforming, partial oxidation and autothermal reforming.

8. (Original) The method of Claim 7, wherein the fuel reformer reaction comprises steam reforming.

9. (Original) The method of Claim 1, further comprising the step of treating a reformate to reduce carbon monoxide concentration.

10. (Original) The method of Claim 9, wherein the step of treating a reformate is at least one of the following processes selected from the group consisting of a water gas shift, preferential oxidation of carbon monoxide, preferential methanation of carbon monoxide with hydrogen on a catalyst, separation of hydrogen in a pressure swing absorption bed, separation of hydrogen in a temperature swing absorption bed, and separation of hydrogen by a hydrogen-selective membrane.

11. (Original) The method of Claim 9 wherein the step of treating a reformate comprises a water gas shift.

12. (Original) The method of Claim 9, wherein the step of treating a reformate consists essentially of at least one water gas shift and at least one preferential oxidation of carbon monoxide.

13. (Original) The method of Claim 1, further comprising the step of heating a reformer with the burner exhaust before driving the expander.

14. (Original) The method of Claim 1, further comprising the step of heating a reformer with the burner exhaust after driving the expander.

15. (Original) The method of Claim 4, wherein the air/steam mixture travels a path from the fuel cell to the burner and wherein water is present in the air/steam mixture in at least part of the path.

16. (Previously presented) The method of Claim 15, further comprising the step of removing water from the air/steam mixture at a selected point in the path before introduction of the mixture into the burner.

17. (Original) The method of Claim 1, wherein the expander is a turbine.

18. (Currently amended) An integrated fuel generator/fuel cell system, the system comprising:

a fuel reformer;

a fuel cell coupled to the fuel reformer;

a cooling system for the fuel cell configured to produce heated water;

a source of pressurized air, pressurized air from the source being used to evaporate the heated water thereby creating a pressurized air/steam mixture;

~~a mixer in which pressurized air from the source is used to evaporate the heated water thereby creating a pressurized air/steam mixture;~~

a burner in which the air/steam mixture is combusted with a fuel to create a steam-containing burner exhaust; and

an expander in which the burner exhaust expands~~, thereby creating mechanical energy which is captured to improve system efficiency~~ to produce a mechanical power output in excess of the power absorbed in compressing the pressurized air.

19. (Original) The system of Claim 18, wherein the expander is a turbine.

20. (Original) The system of Claim 18, further comprising a burner exhaust conduit configured to permit heating of the fuel reformer by the burner exhaust and then to direct the exhaust through the expander.

21. (Original) The system of Claim 18, further comprising a burner exhaust conduit configured to permit heating of the fuel reformer after the exhaust passes through the expander.

22. (Original) The system of Claim 18, wherein the air/steam mixture further comprises water in at least a part of a path between the fuel cell and a point of injection into the burner.

23. (Original) The system of Claim 18, further comprising a carbon monoxide removal system.

24. (Original) The system of Claim 23, wherein the carbon monoxide removal system produces an output which comprises less than about 10 ppm of carbon monoxide on a time-averaged basis.

25. (Currently amended) A method of increasing the efficiency of a fuel cell, the method comprising the steps of:

converting at least some waste heat of the fuel cell to a pressurized gas/steam mixture by evaporating heated cooling water into a pressurized oxygen-containing gas and passing the gas through the fuel cell as oxidant;

heating the gas/steam mixture;

passing the heated mixture through an expander; and

recovering mechanical power from the expander in excess of the power absorbed in compressing the pressurized oxygen-containing gas.

26. (Original) The method of Claim 25, wherein the step of heating is provided by at least one of the sources selected from the group consisting of a combustion zone, exhaust of a combustion zone, a fuel reformer; and a carbon monoxide removal system.

27. (Original) The method of Claim 25, wherein the expander is a turbine.

28. (Currently amended) A method for generating power from fuel cell waste heat comprising the steps of:

evaporating water into pressurized air using waste heat from a fuel cell to create a pressurized air/steam mixture;

reacting the air/steam mixture in a burner to produce a steam-containing exhaust; and,

driving an expander with the steam-containing exhaust to produce mechanical energy <u>in excess of the energy used to compress the pressurized air</u>.

29. (Original) The method of Claim 28, wherein the steam-containing exhaust is a heat source for a fuel reformer.

30. (Original) The method of Claim 29, wherein the fuel reformer conducts at least one reaction selected from the group consisting of steam reforming, partial oxidation and autothermal reforming.

31. (Original) The method of Claim 30, wherein the fuel reformer reaction comprises steam reforming.

32. (Original) The method of Claim 28, further comprising the step of treating a reformate to reduce carbon monoxide concentration.

33. (Original) The method of Claim 32, wherein the step of treating a reformate is at least one of the reactions selected from the group consisting of a water gas shift, preferential

oxidation of carbon monoxide, preferential methanation of carbon monoxide with hydrogen on a catalyst, separation of hydrogen in a pressure swing absorption bed, separation of hydrogen in a temperature swing absorption bed, and separation of hydrogen by a hydrogen-selective membrane.

34. (Original) The method of Claim 32, wherein the step of treating a reformate comprises a water gas shift.

35. (Original) The method of Claim 32, wherein the step of treating a reformate consists essentially of at least one water gas shift and at least one preferential oxidation of carbon monoxide.

36. (Original) The method of Claim 28, further comprising the step of heating a reformer with the burner exhaust before driving the expander.

37. (Original) The method of Claim 28, further comprising the step of heating a reformer with the burner exhaust after driving the expander.

38. (Original) The method of Claim 28, further comprising the step of preheating the air/steam mixture by heat exchange with the steam-containing exhaust before reacting the air/steam mixture.

39. (Original) The method of Claim 28, further comprising the step of using at least some of the air/steam mixture as a humidified oxidant of a fuel cell before evaporating water into pressurized air.

40. (Previously presented) The method of Claim 28, further comprising the step of introducing additional water into the air/steam mixture.

41. (Previously presented) The method of Claim 40, wherein the step of introducing additional water occurs after the mixture has emerged form the fuel cell.

42. (Original) The method of Claim 40, wherein the air/steam mixture travels a path from the fuel cell to the burner and wherein water is present in the air/steam mixture in at least part of the path.

43. (Previously presented) The method of Claim 42, further comprising the step of removing water from the air/steam mixture at a selected point in the path before introduction of the mixture into the burner.

44. (Original) The method of Claim 28, wherein the expander is a turbine.

45. (Currently amended) An integrated fuel generator/fuel cell system, the system comprising:

a fuel cell having a cathode and an anode;

a source of pressurized air coupled to the cathode of the fuel cell;

a fuel reformer coupled to the fuel cell;

a mixer in which pressurized air from the source is used to evaporate heated water thereby creating a pressurized air/steam mixture used as a fuel cell oxidant;

a burner in which the air/steam mixture is combusted with a fuel to create a steam-containing burner exhaust gas; and

an expander in which the burner exhaust gas expands, thereby creating mechanical energy in excess of the energy used to compress the pressurized air.

46. (Original) The system of Claim 45, further comprising at least one heat exchanger to heat the air/steam mixture;

47. (Original) The system of Claim 46, wherein at least one heat exchanger is located within the fuel reformer.

48. (Original) The system of Claim 47, further comprising a radiator for cooling the fuel cell coolant wherein the radiator is configured to a size smaller than a size required to otherwise cool the coolant if a portion was not being used to humidify the cathode of the fuel cell.

49. (Original) The system of Claim 45, wherein the mixer comprises a humidifier.

50. (Original) The system of Claim 45, wherein the heated water is supplied by a fuel cell coolant.

51. (Original) The system of Claim 45, wherein the expander is a turbine.

52. (Original) The system of Claim 45, further comprising a burner exhaust conduit configured to permit heating of the fuel reformer by the burner exhaust and then to direct the exhaust through the expander.

53. (Original) The system of Claim 45, further comprising a burner exhaust conduit configured to permit heating of the fuel reformer after the exhaust passes through the expander.

54. (Previously presented) The system of Claim 45, wherein the air/steam mixture further comprises water in at least a part of a path between the fuel cell and a point of introduction into the burner.

55. (Original) The system of Claim 45, further comprising a carbon monoxide removal system.

56. (Original) The system of Claim 55, wherein the carbon monoxide removal system produces an output which comprises less than about 10 ppm of carbon monoxide on a time-averaged basis.

57. (Original) The method of claim 1, further comprising the use of the heat exchanger that cools the exhaust after it leaves the expander as a preheater for at least one of the feeds for the burner, thereby recuperating the turbine exhaust.

58. (Original) The method of claim 25, further comprising the use of the heat exchanger that cools the exhaust after it leaves the expander as a preheater for at least one of the feeds for the burner, thereby recuperating the turbine exhaust.

59. (Original) The method of claim 28, further comprising the use of the heat exchanger that cools the exhaust after it leaves the expander as a preheater for at least one of the feeds for the burner, thereby recuperating the turbine exhaust.

60. (Original) The system of claim 18, further comprising the provision of a heat exchanger that cools exhaust from the expander and heats at least one of the feeds for the burner, thereby recuperating the turbine exhaust.

61. (Previously presented) The method of Claim 1, further comprising preheating at least one of a steam fuel mixture, anode gas, and steam.

62. (Previously presented) The method of Claim 61, wherein the preheating is performed through concentrically arranged annuli.

63. (Previously presented) The fuel reformer of Claim 18, further comprising a shell-type exchanger having annuli with gaps formed between the shells between which heat is exchanged.

64. (Previously presented) The fuel reformer of Claim 63, wherein the annuli are arranged around a centrally located heat exchanger through which expanded burner exhaust is routed.

65. (Previously presented) The fuel reformer of Claim 63, further comprising at least one of a high temperature shift bed, a low temperature shift bed, a burner, a partial oxidation reactor, and an autothermal reformer around which the small gap annuli are arranged.

66. (Previously presented) A hydrocarbon reforming reactor comprising a fuel reformer having a shell-type exchanger having shells with gaps in the annuli between shells, into which heat from at least one of a burner, burner exhaust, a high temperature shift bed, a low temperature shift bed, a partial oxidation reformer, and an autothermal reformer is transferred and used to preheat reforming feedstock and burner fuel through the shell walls of adjacent gaps.

67. (Previously presented) The fuel reformer of Claim 66, wherein reforming feedstock includes at least one of fuel, steam, and a fuel/steam mixture.

68. (Previously presented) The fuel reformer of Claim 66, wherein burner fuel includes at least one of anode gas and cathode gas from the integrated fuel cell.

69. (Previously presented) The fuel reformer of Claim 66, further comprising an expander into which burner exhaust is routed.

70. (Previously presented) The fuel reformer of Claim 69, further comprising a centrally located passage through which exhaust from the expander is routed, and around which the annular shells are arranged.

71. (Previously presented) The fuel reformer of Claim 66, further comprising a reformer having seven shells.

72. (Previously presented) The fuel reformer of Claim 71, wherein anode gas, cathode gas, fuel, and a fuel/steam mixture are preheated.

73. (Previously presented) The fuel reformer of Claim 66, wherein at least one burner and a reforming catalyst are contained in the same annulus shell.

74. (Previously presented) A method of reforming hydrocarbons to provide a hydrogen rich gas comprising the steps of:

generating heat by performing at least one of combustion, partial oxidation, water gas shift, autothermal reforming and selective oxidation;

transferring generated heat through walls of shells in a plurality of nested shells having an annular gap being defined between each of the successive shells;

preheating a stream of hydrocarbon feed stock in a gap;

preheating a stream of steam in a second gap;

preheating a stream of fuel for a burner in a third gap; and

introducing the hydrocarbon feed stock and steam to a bed of reforming catalyst.

75. (Previously presented) The method of claim 74, wherein the hydrocarbon feed stock stream and the steam stream are a single mixed stream.

76. (Previously presented) The method of claim 74, further comprising routing a heated stream through an annularly disposed gap and transferring heat from the heated stream to material in another gap.

77. (Previously presented) A reactor for generating a hydrogen-enriched reformate from hydrocarbon feed stocks comprising:

shells having walls arranged coaxially about each other;

a gap being defined between each of the successive shells, the shells being configured to permit heat transfer directly from one gap to another through the shell walls;

wherein a first gap is configured to conduct a steam reforming reaction, and at least one of the exothermic reactions from the group consisting of combustion, partial oxidation, autothermal reforming, water gas shift, preferential oxidation, and combinations thereof; and

the reactor being configured so that hydrocarbon feed stock is preheated in a second gap and fuel for a burner is preheated in a third gap.

78. (Previously presented) The reactor of claim 77 including that the reactor being further configured so water/steam is preheated in a fourth zone.

79. (Previously presented) The reactor of claim 78 including that the reactor being further configured so that water/steam is preheated along with the hydrocarbon feed stock in the second zone.

80. (Previously presented) A reactor for generating a hydrogen-enriched reformate from hydrocarbons comprising:

a plurality of nested shells having walls arranged coaxially and defining a gap between each of the successive shells forming a plurality of coaxial zones, the shells being configured to permit heat transfer from one zone to another;

wherein a first zone contains a catalyst selected from the group including a steam reforming catalyst and a shift catalyst; and

the reactor being configured so that a hydrocarbon feed stock is preheated in a second zone, and fuel for a burner is preheated in a third zone.